3. The reactant emulsion, diesel fuel, and emulsifier A were circulated through the IKA high shear mixer for about 30 seconds and back to the processing tank.

4. Following about 30 second mix and while continuing to circulate through the mixer, a total of about 28.4 gallons of water were added through a charging line immediately upstream of the mixer.

5. Once all water was added, the mixture continued to circulate through the IKA mixer for about an additional 16 minutes.

6. Samples of concentrated emulsion were taken from the processing tank at various time intervals during this mix period representing 1, 2, 4, 7 and 10.4 tank turnovers. A tank turnover is defined as the duration to pump 100 gallons through the mixer.

7. The concentrated emulsion was pumped to a diluter tank and diluted with about 229.3 gallons of CARB diesel fuel.

8. The diluter tank was circulated with a centrifugal pump for about 9 minutes.

9. A sample of the final aqueous hydrocarbon fuel emulsion was taken from the diluter tank.

10. The results are found in Table I.

Table I

	Particle Size Distribution		% Oily	% White	%	% Oil	% Oily	% White	%
Sample description	**Mean µm**	**Mode µm**	**7 day static storage (room temperature)**			**7 day static storage (43°C)**			
Example 1: 1:24 mn:sec	0.78	0.47	6	94	3	9		91	7
Example 1: 2:48 mn:sec	0.77	0.47	6	94	4	9		91	7
Example 1: 5:36 mn:sec	0.77	0.52	4	96	4	9		91	7
Example 1: 9:48 mn:sec	0.79	0.52	4	96	4	9		91	7
Example 1: 12:36 mn:sec	0.78	0.52	6	94	4	9		91	7
Example 2: 1:24 mn:sec	0.63	0.43	6	94	4	6		94	6
Example 2: 2:48 mn:sec	0.64	0.43	6	94	4	7		93	6
Example 2: 5:36 mn:sec	0.68	0.47	4	96	4	7		93	6
Example 2: 9:48 mn:sec	0.63	0.47	6	94	3	7		93	6
Example 2: 12:36 mn:sec	0.63	0.47	4	96	3	7		93	6
Example 3: 1:32 mn:sec	1.31	1.45							
Example 3: 3:04 mn:sec	1.40	1.59							
Example 3: 6:06 mn:sec	1.30	0.91							
Example 3: 10:44 mn:sec	1.05	1.20							
Example 3: 16:00 mn:sec	0.92	1.24							
Example 3: final sample	0.89	0.63	3	97	7	3	6	91	12
Example 4: 1:32 mn:sec	1.12	1.32							
Example 4: 3:04 mn:sec	1.05	1.00							
Example 4: 6:06 mn:sec	0.98	1.00							
Example 4: 10:44 mn:sec	0.90	0.83							
Example 4: 16:00 mn:sec	0.83	0.76							
Example 4: final sample	0.86	0.83	3	97	7	4	4	91	10

The continuous process described herein depicts another embodiment of the invention. The feeds of the hydrocarbon fuel, emulsifier, reactant emulsion and water are introduced as discreet feeds or in the alternative combinations of the discreet feeds, to form a homogeneous hydrocarbon fuel emulsion. It is preferable that the processing streams of the fuel, emulsifier, water and emulsion reactant, are introduced as close to the inlet of the emulsification device as possible. It is preferable that the emulsifier is added to the fuel as a hydrocarbon fuel emulsifier stream prior to the discreet feeds combining together.

The ratio of the hydrocarbon fuel, emulsifier and water to reactant emulsion in one embodiment is about 1% hydrocarbon fuel, emulsifier and water to about 99% reactant emulsion, in another embodiment about 99% hydrocarbon fuel, emulsifier

and water to about 1% reactant emulsion, in another embodiment about 15% hydrocarbon fuel, emulsifier and water to about 85% reactant emulsion, in another embodiment about 40% hydrocarbon fuel, emulsifier and water to about 60% reactant emulsion, in another embodiment about 60% hydrocarbon fuel, emulsifier and water to about 40% reactant emulsion, and in another embodiment 50% hydrocarbon fuel, emulsifier and water to about 50% reactant emulsion. The hydrocarbon fuel emulsifier stream during startup and shutdown is such that the ratio of water to hydrocarbon fuel emulsion mixture is never greater than the steady state condition.

The continuous process generally occurs under ambient conditions. The continuous process is generally done at atmospheric pressure to about 500 psi, in another embodiment in the range of about atmospheric pressure to about 120 psi, and in another embodiment in the range of about atmospheric pressure to about 50 psi. The continuous process generally occurs at ambient temperature. In one embodiment the temperature is in the range of about ambient temperature to about 212°F, and in another embodiment in the range of about 40°F to about 150°F.

The emulsification provides for the desired particle size and a uniform dispersion of water in the fuel and occurs at a shear rate in the range of greater than 0 s^{-1} to about 500,000 s^{-1}, preferably about 20,000 s^{-1} to about 200,000 s^{-1}, more preferably of about 25,000 s^{-1} to about 125,000 s^{-1} of shearing. If more than one emulsification step is used, the shear rates of the emulsification steps can be the same, similar or different, depending on the emulsifier used and the ratio of reactant emulsion to fuel additive and/or water.

In another embodiment the emulsion flows through at least one to several emulsification devices. In another embodiment, the emulsion flows through the next one to five emulsification devices. The emulsion flows through the emulsion devices in series, directly from one emulsification device to the next emulsification device in the series.

In one embodiment there is no intermediate holding tank between the emulsification steps. The emulsion is not aged between the emulsification steps. Generally the time the emulsion flows from one emulsification device to another emulsification device in less than 5 minutes, in another embodiment less than 4 minutes, in another embodiment less than 3 minutes, in another embodiment less than 2 minutes, in another embodiment less than 1 minute, and in another embodiment less than 30 seconds.